

MIT World (20090507) Barry Everitt - Neural Basis of Drug Addiction (about lecture)

URL: <http://mitworld.mit.edu/video/712>

About the Lecture

How does someone move from recreational drug use to addiction? **Barry Everitt's** group at the University of Cambridge has been trying to break down the stages and neural circuitry of addiction with great precision.

Everitt's research attempts to operationalize a progression in animals from the voluntary taking of drugs, to the acquired habit of drug-taking, to the stage of compulsive drug-seeking and consumption, "where individuals have really lost control." This progression seems rooted in the sequential activation of different learning systems in the brain, which are particularly sensitive to the neurotransmitter dopamine.

Research suggests that drug-taking is initially dependent on the nucleus accumbens (part of the ventral striatum), but its establishment involves the dorsal striatum. Studies show that dopamine in the dorsal striatum is causally involved in establishing drug-seeking behavior in rats. As the animal gets accustomed to taking the cocaine, there's a "shift in the balance of associative encoding from ventral to dorsal striatum." Cocaine craving and self-administration seem to change the functioning of the dorsal striatum in monkeys and humans as well.

While this shift from ventral to dorsal striatum depends to some degree on "pharmacology" (cocaine's impact on dopaminergic systems), Everitt has hypothesized that it may also involve "spiraling circuitry" connecting the ventral striatum, the midbrain -- the brain's motivational and motor mechanisms -- and the dorsal striatum. Everitt speculates that the compulsive nature of drug seeking may be rooted in part in the prefrontal cortex, home to "top-down executive control mechanisms." He describes research that attempted to model this type of compulsion. Animals with short-term access to cocaine and most animals with long-term access to cocaine suppressed their drug-seeking responses when punished. But a subgroup of 20% "persisted in seeking cocaine in the face of punishment." This result has been replicated many times now, and turns out to have a parallel among humans. This, says Everitt, "brings up the issue of vulnerability to drug addiction."

Additional research suggests that impulsivity is a "behavioral characteristic that predicts the transition from initial drug intake to loss of control ... to compulsive seeking and taking" of drugs. Highly impulsive animals denied cocaine become more impulsive and drug seeking over time, leading to relapses. Everitt and others are tracing the neural basis of compulsivity to impairment in the prefrontal cortex, which involves "a loss of control over maladaptive habits" established after long-term drug taking.

Host

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Lecture Details

- Location: 46-3002

"The initial acquisition of seeking and taking of drugs in a goal-directed sense depends on mechanisms operating through the ventral parts of the striatum. This shifts to be under control of mechanisms in the dorsal striatum as it becomes habitual. "

Barry Everitt

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